Contribution to the History of the Reflex Zenith-Tube.
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It may not be uninteresting to the Society to lay before them the following note concerning an instrument, notable in English astronomy, whose history has passed through various phases—in the beginning of high hope, later of grievous perplexity, finally of severe disappointment. Mr. Adams, in 1852, concluded his address of presentation of the medal to Mr. Peters with the following words : " We may hope that the beautiful reflex zenith telescope of the Astronomer Royal . . . will enable us ere long to take many firm, though long-reaching, steps into regions of space hitherto untrodden." Subsequently, however, the successive discussions of Main and Downing gave unacceptable results, as is well known, and in 1882 the observations were silently abandoned.

In the *Astronomical Journal*, No. 511, it is shown that this instrument, so far from being a failure, has provided us with an invaluable record of a phenomenon which was unsuspected at the time the observations were made, and which has within the last decade become the subject of the most active and general inquiry ; namely, the relative motions of the earth's axes of rotation and figure. There is one topic, not there touched upon, on which a few words here may not be superfluous. The object of this note is to expose directly and analytically how the anomalous parallax of γ *Draconis* and aberration were brought about.

In *Astronomical Journal*, vol. xii., p. 177, it is shown that the coefficients of the sine and cosine of the Sun's longitude,

$$Y = qu - p\pi + \eta, \quad Z = pu + q\pi + \zeta \quad . \qquad . \quad (A)$$

are functions of four unknown quantities; namely, the parallax π, the correction u of the assumed aberration-constant, and the coordinates of the annual component of the motion of the pole,

$$\eta = -r_2 \sin G', \quad \zeta = -r_2 \cos G'$$

r_2 and G' being furnished by observation, and the coefficients

$$p = \sin \epsilon \cos \delta - \cos \epsilon \sin \alpha \sin \delta, \quad q = \cos \alpha \sin \delta$$

from known quantities. For γ *Draconis* we have (1865) $p = +0.965, q = -0.022$. From *Astronomical Journal*, No. 511, p. 59, we take :

	1857-63.	1864-70.
r_2	$0''.166$	$0''.134$
G'	$323°$	$313°$

consequently η $+0''\cdot100$ $+0''\cdot098$

    ,, ζ $-0''\cdot133$ $-0''\cdot091$

which are the values of Y and Z if u and π are zero. If, on the contrary, we ignore η and ζ, as was in effect done in the earlier attempts to get aberration and parallax, we have from (A)

$$u = \frac{q\mathrm{Y}+p\mathrm{Z}}{p^2+q^2}, \quad \pi = \frac{q\mathrm{Z}-p\mathrm{Y}}{p^2+q^2}$$

which would give, introducing the above data and the assumed aberration $20''\cdot505$,

	Aberration.	Parallax.
1857–63	$20''\cdot365$	$-0''\cdot100$
1864–70	$20''\cdot408$	$-0''\cdot099$
Mean . .	$20''\cdot386$	$-0''\cdot100$

The values actually found by Downing, from the observations 1857–75, were

$$20''\cdot378 \quad -0''\cdot131$$

thus a satisfactory agreement with the foregoing, the differences being nominal and doubtless due to the fact that he included the observations for 1871–75, which I did not.

The above demonstration, while possibly unnecessary, is not uninteresting as showing explicitly how the former anomalous results are harmonised with the truth as now perceived. The old discussions are practically attempts to find four unknowns from two equations.

It is certainly a comfort that the perplexing enigma connected with the Reflex Zenith-Tube has finally found its answer, and that the patience of the astronomers who executed this laborious series meets at last an adequate reward of useful result. The question naturally arises in the mind whether a resumption of observations by this method, with an instrument optically capable of more easily showing γ *Draconis* in the daytime, and an earnest attention to securing a higher precision as regards accidental error of observation, would not be a worthy undertaking.

If such a resumption of the investigation under these more favourable conditions be feasible, it scarcely needs to be suggested that it ought properly to extend to all the stars passing the Greenwich zenith bright enough for reflection-observation on a dark sky. This would determine both the aberration and the latitude-variation, which is not possible with a single star. At least two groups of stars in opposite right ascension would be desirable. Assuming the limit of brightness to be $6\frac{1}{2}$ magnitude, a list of all the stars that might be embraced in such a programme is appended.

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No.	Mag.	(1905·0) α			δ	
		h	m	s	° ′	
1	6·0	0	19	8	+51 29·6	—
2	6·1	1	44	52	28·0	—
3	6·6	1·	58	0	30·7	—
4	5·4	4	59	14	28·4	Fl. 9 Aurigæ.
5	6·6	5	39	29	29·0	—
6	6·5	5	43	23	29·2	—
7	6·6	7	26	33	31·1	—
8	6·8	10	24	18	28·8	—
9	6·0	13	59	28	25·7	—
10	2·5	17	54	.24	30·0	γ Draconis.
11	6·8	18	59	59	29·6	—
12	4·0	19	27	19	31·5	ι Cygni.
13	6·4	20	32	4	31·6	—

On the Velocity of α Persei. By H. F. Newall.

The following additional observations of the velocity of α *Persei* in the line of sight were obtained before I left England to observe the eclipse of the Sun in Sumatra. They are in continuation of the observations published in an earlier note (*Monthly Notices*, vol. lxi., p. 12), and were obtained with the same instrument and measured in the same way as those before published. The values of the velocity are the means of two measurements made, one by myself, the other by my assistant, A. W. Goatcher. The result for each photograph is based on measurement of about eleven lines between λ 4260 and λ 4325, and the method of reduction is the same as that briefly described in a paper published in *Monthly Notices*, vol. lxi., p. 12.

Velocity of α Persei in the Line of Sight.

Plate Number.				Velocity relative to Earth.	Correction for Earth's Orbital velocity.	Velocity relative to Sun.
F. 139	1900	Nov.	9·35	− 2·7	+ 5·8	+ 3·1
F. 141			10·35	− 4·4	+ 5·4	+ 1·0
F. 142			13·34	− 3·7	+ 4·1	+ 0·4
F. 143			15·33	− 4·0	+ 3·2	− 0·8
F. 145			16·33	− 6·7	+ 2·7	− 4·0
F. 154		Dec.	10·25	+ 7·0	− 8·1	− 1·1